The Salem-Attur Shear Zone is a Low Angle Thrust: A New Kinematic Interpretation from East of Salem, Tamil Nadu

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The Salem-Attur shear zone (SASZ) runs in an E-W direction in the Southern Granulite Province forming an important tectonic lineament together with the Palghat - Cauveri shear zone. It demarcates the suture between two geologically distinct terrains namely northern Archean granulite terrain and southern Neoproterozoic granulite terrain. It has been a long-standing controversy about the sense of movement along SASZ. While a dextral shear has been interpreted based on apparent offset of the hills, it has been described to be a vertical thrust on the basis of down dip stretching lineation. Further, several workers suggest SASZ to be transpressional - dextral strike slip shear zone.

We have carried out structural study of the SASZ between Odyarpatti and S. Nata Mangalam village, 7 km and 16 km east of Salem respectively along Salem–Belur Road and report some of the mylonitic fabrics for the first time that suggest the SASZ to be a subhorizontal thrust. The variable attitude of the shear zone has been attributed to late stage folding. The area covering Odyarpatti and S. Nata Mangalam village exposes charnockites, banded magnetite quartzite and biotite-hornblende schist. Banded magnetite quartzites occur as thin pinched out bands within charnockite. The charnockites are well-banded rocks consisting of alternate mafic and felsic bands; mafic bands are made up of equigranular ortho- and clinopyroxenes, plagioclase and hornblendes and the felsic bands comprise quartz and alkali feldspar. The biotite-hornblende schists are the retrogression products of the charnockites due to shearing and fluid activity. The biotite-hornblende schists are fine to medium-grained rocks consisting of quartz, feldspar, biotite, and hornblende. At several places, feldspar porphyroclasts of variable dimension occur along the schistosity. The schists generally occupy the low-lying areas due to its extremely weatherable character. Meso- and microscopic structures like porphyroclasts, S-C fabric, hornblende fishes, and quartz ribbons suggest the mylonitic origin of the schists, produced from the brittle-ductile shearing of the charnockites and the schistosity represent the mylonitic foliation in the rock. Hence, the outcrops of the schists define the location of the SASZ, which is anastomosing in nature.

The mylonitic foliation in general strikes in E-W direction and dips steeply either to NNW or SSE. However, at Odyarpatti they become almost horizontal. On this horizontal mylonitic foliation, stretching lineation/ductile slickenside striae are present in NE-SW direction; this suggests horizontal slip in the above direction. The lineations are more akin to ductile slickenside striae as they occur in form of grooves and ribs. The stretching lineation and ductile slickenside striae could be mutually parallel in the area. The mylonitic foliations are folded into open to tight folds (F2) with crenulation cleavages. The axial plane of such folds strike ENE-WSW while the axis shows gentle to steep plunge towards ENE. The limbs of the folds contain down dip mylonitic lineation that assume horizontality on the hinge.

The microfabric analysis of the mylonites suggests a sinistral shearing. The subhorizontal mylonitic foliation with NNE trending subhorizontal lineations lead to implication that the shear zone is in the nature of a subhorizontal thrust similar to thrusts in the Himalayan fold- thrust belt. The thrusting is towards NNE and has taken place post kinematic to granulite facies metamorphism.